



G10_User Guide_V1.0



Application Note



Datasheet



Solution

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Version History

Version	Chapter	What is new
V1.0	New Version	Monya

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1 Introduction

This document describes features, functions and interfaces of G10 modem in great detail. G10 is a Quad-band GSM/GPRS modem that works on frequencies of GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz, which is a ideal solution for wireless M2M application, the modem features GPRS multi-slot class 10/8(optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4. With the help of this document user can understand G10 interface specifications, electrical and mechanical quickly.



Figure 1: G10 overview



Note: The G10 Modem is fully complying with RoHS requirements of European standards.

Table 1: G10 key features

Feature	Implementation
Power supply	5V ~ 16V

Frequency bands	<ul style="list-style-type: none"> ● G10 Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900. G10 can search the 4 frequency bands automatically. The frequency bands also can be set by AT command “AT+CBAND”. ● Compliant to GSM Phase 2/2+
Transmitting Power	<ul style="list-style-type: none"> ● Class 4(2W) at GSM 850 and EGSM 900 ● Class 1(1W) at DCS 1800 and PCS 1900
GPRS connectivity	<ul style="list-style-type: none"> ● GPRS multi-slot class 10 (default) ● GPRS multi-slot class 8 (option)
Temperature range	<ul style="list-style-type: none"> ● Normal operation: -20℃ ~+70℃ ● Restricted operation: -30℃ ~-20℃ and +70℃ ~+75℃ * ● Storage temperature: -45℃ ~+90℃
Data GPRS	<ul style="list-style-type: none"> ● GPRS data downlink transfer: max.85.6kbps ● GPRS data uplink transfer: max.42.8kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● Integrate the TCP/IP protocol ● Support Packet Broadcast Control Channel (PBCCH)
CSD	<ul style="list-style-type: none"> ● Support CSD transmission
USSD	<ul style="list-style-type: none"> ● Unstructured Supplementary Services Data (USSD) support
SMS	<ul style="list-style-type: none"> ● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
FAX	Group 3 Class 1
SIM interface	Support SIM card: 1.8V, 3V
External antenna	SMA type RF connector
RS232 serial port	Serial port <ul style="list-style-type: none"> ● Full modem interface with status and control lines, unbalanced, asynchronous. ● 1200bps to 115200bps. ● Can be used for AT commands data stream. ● Support RTS/CTS hardware handshake and software flow control. ● Multiplex ability according to GSM 07.10 Multiplexer Protocol. ● Autobauding supports baud rate from 1200 bps to 57600 bps.
SIM Toolkit	GSM 11.14 Release 99
Physical characteristics	Size: 110*54*25mm Weight: 120g
Firmware upgrade	Firmware upgradeable by RS232 interface

*G10 does work at this temperature, but some radio frequency characteristics may deviate from the GSM specification.

2 Interface Introduction

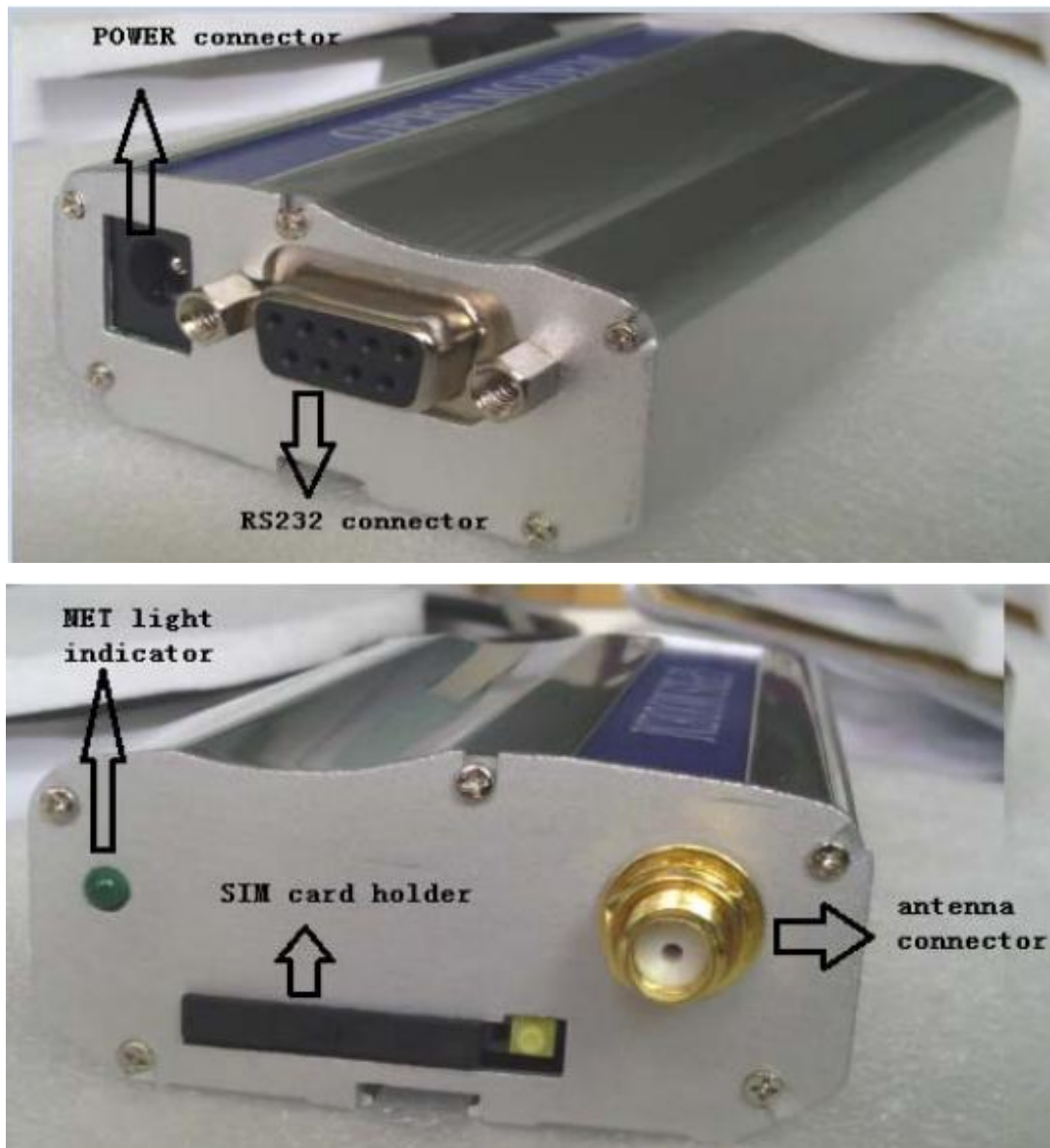


Figure 2: Interface overview

2.1 Power supply connector

Customer can use the DC adapter that SYSTECH provides as the power source.

If customer does not use the adapter, then DC source should be satisfied with the following requirements.

- Input voltage range 5~16V
- Normal voltage 6V
- Current ability 2A

Table 2: The consumption in sleep mode

G10	@5V	@12V	@15V
Sleep current	14.5mA	7.75mA	5.02mA

2.2 DB9 connector

G10 provides one asynchronous RS232 serial port (female). The RS232 standard interface serves to connect a PC, Data Terminal Equipment (DTE) or other application, which acts as host controller of the G10 modem with all its functions. Through the RS232 interface it can be used as GSM/GPRS modem for sending and receiving of SMS, Data and Fax calls.


Figure 3: DB9 connector
Table 3: 9-pole D-sub (female) RS232

Pin no.	Signal name	I/O	Function
1	DCD	O	Data Carrier Detected
2	RXD	O	Receive Data
3	TXD	I	Transmit Data
4	DTR	I	Data Terminal Ready Attention: The ignition of G10 modem is activated via a rising edge of high potential (+3 ... +15V)
5	GND	-	Ground
6	DSR	O	Data Set Ready
7	RTS	I	Request To Send
8	CTS	O	Clear To Send
9	RI	O	Ring Indication

Note: G10 supports autobaoding, autobaoding allows G10 to automatically detect the baud rate of the host device. User can use AT command “AT+IPR=x” to set a fixed baud rate and the setting will be saved to non-volatile flash memory automatically. After the configuration is set as fixed baud rate, the URC such as “RDY”, “+CFUN: 1” and “+CPIN: READY” will be reported when G10 is powered on.

Hyper terminal usually as the PC software tool to operate G10; customer can set up a connection between PC and modem, configure the port properties as the figure 4 shows.

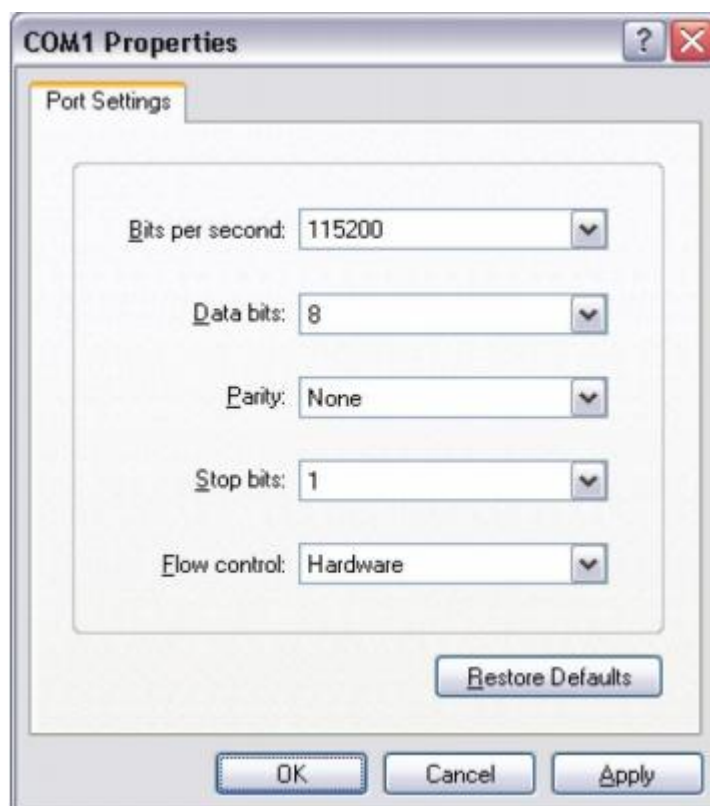


Figure 4: COM port properties of the hyper terminal

2.3 SMA connector

Antenna connector allows transmission of radio frequency (RF) signals between the modem and the external supplied antenna. The G10 modem is fitted with a 50 Ω male SMA connector.

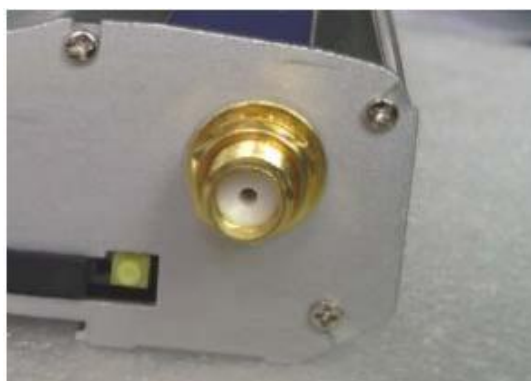


Figure 5: Antenna interface

The antenna is a very important component in the system. Since the antenna transmits and

receives electromagnetic signal, and its efficiency depends on the antenna's type, placement and the environment of the antenna operating.

The recommended antenna specifications are showed in Table 4:

Table 4: Antenna specifications

Frequency range	GSM 850/900/1800/1900 MHz
Impedance	50 ohm
Input power	>33dBm (2W) peak power in GSM
VSWR recommended	$\leq 2:1$
VSWR absolute max	$\leq 10:1$
Gain	$\leq 3\text{dBi}$

The antenna performance is very easily influenced by other electronic devices. So the antenna placement should be considered carefully as follow.

1. Place away from other electronic devices or other antennas.
2. Place far away from metal material.
3. Face the base station antenna directly if the signal strength is very weak.

2.4 GPRS status LED

A green led indicates the modem status and GSM net status, after the modem been powered up and registered to the network, it will blink at a certain frequency.



Figure 6: Indicator LED

Table 5: Status of the NETLIGHT indicator (Green)

Status	G10 behavior
Off	G10 is not running
64ms On/ 800ms Off	G10 not registered the network
64ms On/ 3000ms Off	G10 registered to the network
64ms On/ 300ms Off	GPRS communication is established

2.5 SIM card holder

The SIM interface complies with the GSM Phase 1 specification and the new GSM Phase 2+ specification for FAST 64 kbps SIM card. Both 1.8V and 3.0V SIM card are supported. The SIM interface is powered from an internal regulator inside the modem.



Figure 7: SIM card holder

3 Quick start

3.1 Setting up the modem

To set up the modem, do the following:

- Press SIM card holder ejector (yellow button) with a sharp object.
- Insert the SIM card in the holder.
- Verify the SIM card fits in the holder properly.
- Connect the GSM/GPRS antenna to the SMA connector.
- Connect both sides of the serial cable (9-pin Sub HD connector on the modem side).
- Connect the power supply to the power supply source.
- Plug the power supply cable into the modem and switch on the external power supply.
- Now the modem is ready to work. The GPRS status LED begin to ON and flash.

3.2 Check the communication with the modem

- Connect the RS232 link between the DTE (port COM) and the modem (DCE).
- Configure the RS232 port of the DTE as follows
 - ◇ Bits per second: 115200 bps
 - ◇ Data bits: 8
 - ◇ Parity: None
 - ◇ Stop bits: 1
 - ◇ Flow control: Hardware Flow control
- Using a communication software such as Hyper Terminal program, enter the AT command.
The response of the modem must be OK displayed in the Hyper Terminal window.

4 Electrical, Reliability and Radio Characteristics

4.1 Absolute maximum ratings

The absolute maximum ratings stated in following table are stress ratings under non-operating conditions. Stresses beyond any of these limits will cause permanent damage to G10.

Table 6: Absolute maximum ratings

Symbol	Parameter	Min	Typ	Max	Unit
V _{BAT}	Power supply voltage	4.5	-	16	V
V _I [*]	Input voltage	-0.3	-	3.1	V
I _I [*]	Input current	-	-	10	mA
I _O [*]	Output current	-	-	10	mA

*These parameters are for digital interface pins, such as UART, DEBUG.

4.2 Recommended operating conditions

Table 7: Recommended operating conditions

Symbol	Parameter	Min	Typ	Max	Unit
V _{BAT}	Power supply voltage	5	6	16	V
T _{OPER}	Operating temperature	-30	+25	+75	°C
T _{STG}	Storage temperature	-45		+90	°C

4.3 Electro-Static discharge

G10 is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 8: The ESD characteristics (Temperature: 25°C, Humidity: 45%)

Test item	Contact discharge	Air discharge
Shell	±10KV	±15KV
RF interface	±10KV	±15KV
RS232 interface	±10KV	±15KV
SIM card holder	±10KV	±15KV

4.4 Operating frequency

The operating frequencies in GSM850, EGSM900, DCS, PCS modes are conform to the GSM Specifications, shown as bellow.

Table 9: Operating frequency

Mode	Freq.TX(MHz)	Freq.RX(MHz)	Channels(A RFC)	TX-RX offset
GSM-850	824-849	869-894	128-251	45MHz
EGSM-900	890-915	935-960	0-124	45MHz
	880-890	925-935	975-1023	45MHz
DCS-1800	1710-1785	1805-1880	512-885	95MHz
PCS-1900	1850-1910	1930-1990	512-810	80MHz

4.5 Transmitter output power and receiver sensitivity

The G10's conducted transmitter output power and receiver sensitivity are shown as bellow:

Table 10: Transmitter output power and receiver sensitivity

Mode	Power(dBm)	Sensitivity(dBm)
GSM-850	+33	-108
EGSM-900	+33	-108
DCS-1800	+30	-107
PCS-1900	+30	-107

5 Package content

G10 package include:

- G10 modem: 1 PCS
- Power supply: 1 PCS
- Data cable: 1 PCS
- GSM/GPRS antenna: 1 PCS

Appendix

A. Related Documents

Table 11: Related documents

SN	Document name	Remark
1	SIM900_AT Command Manual	SIM900 AT Command Manual
2	AN_SIM900_TCPIP	TCP/IP Applications User Manual
3	SIM900_Multiplexer User Manual_Application Note	SIM900 Multiplexer User Manual Application Note
4	AN_Serial Port	Application Note About Serial Port
5	SIM900_Serial Update Tool UGD	Update Tool User Manual
6	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control
7	GSM 07.07:	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment(ME)
8	GSM 07.10:	Support GSM 07.10 multiplexing protocol
9	GSM 07.05:	Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment-Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
10	GSM 11.14:	Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module-Mobile Equipment (SIM-ME) interface
11	GSM 11.11:	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module-Mobile Equipment (SIM-ME) interface
12	GSM 03.38:	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
13	GSM 11.10:	Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part1: Conformance specification

B. Terms and Abbreviations

Table 12: Terms and abbreviations

Abbreviation	Description
AT	Attention commands
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready

DTU	Data Transmit Unit
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FR	Full Rate
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
IMEI	International Mobile Equipment Identity
Li-ion	Lithium-Ion
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
NA	Not Access
PAP	Password Authentication Protocol
PBCCH	Packet Broadcast Control Channel
PCB	Printed Circuit Board
PCL	Power Control Level
PCS	Personal Communication System, also referred to as GSM 1900
PDU	Protocol Data Unit
PPP	Point-to-Point Protocol
RF	Radio Frequency
RMS	Root Mean Square (value)
RTC	Real Time Clock
RX	Receive Direction
SIM	Subscriber Identification Module
SMS	Short Message Service
TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
phonebook abbreviations	
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)

ON	SIM (or ME) own numbers (MSISDNs) list
RC	Mobile Equipment list of received calls
SM	SIM phonebook
NC	Not connect

C. Safety Caution

Table 13: Safety caution

Marks	Requirements
	When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive to not operate normally for RF energy interference.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forget to think much of these instructions may lead to the flight safety or offend against local legal action, or both.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.
	<p>GSM cellular terminal or mobile operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, for example no mobile fee or a invalid SIM card. While you are in this condition and need emergent help, please remember using emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.</p> <p>Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call.</p> <p>Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.</p>



Contact us:

SYSTECH

Address: 702, Block A, Tsinghua Hi-Tech Park, Nanshan, Shenzhen, China

Tel: 400-993-9390

Fax: 86-755-2603 0411

Post code: 518057

www.syseMBED.com